Current and Potential Atmospheric Effects of Forest Management at Department of Defense Installations

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Presentation Based on Two Studies
(Detailed Technical Reports Available)

- Carbon Sequestration on Department of Defense Lands (Coeli Hoover)

- Urban Forest Carbon Analysis for the Cantonment of Fort Knox, Kentucky (David Nowak)

Overall Objectives

- Estimate current carbon storage on selected installations
- Evaluate effects of forest management activities on carbon sequestration
- Examine potential of urban forestry to enhance carbon sequestration
- Assess which factors most influence forest carbon storage potential

List of Installations

- Eglin AFB   FL
- Fort Eustis   VA
- Fort Gordon   GA
- Fort Jackson   SC
- Fort Knox   KY
- Fort Drum   NY
- Fort Lewis   WA

- Fort Lee   VA
- Fort McClellan   AL
- MCB Quantico   VA
- Fort Rucker   AL
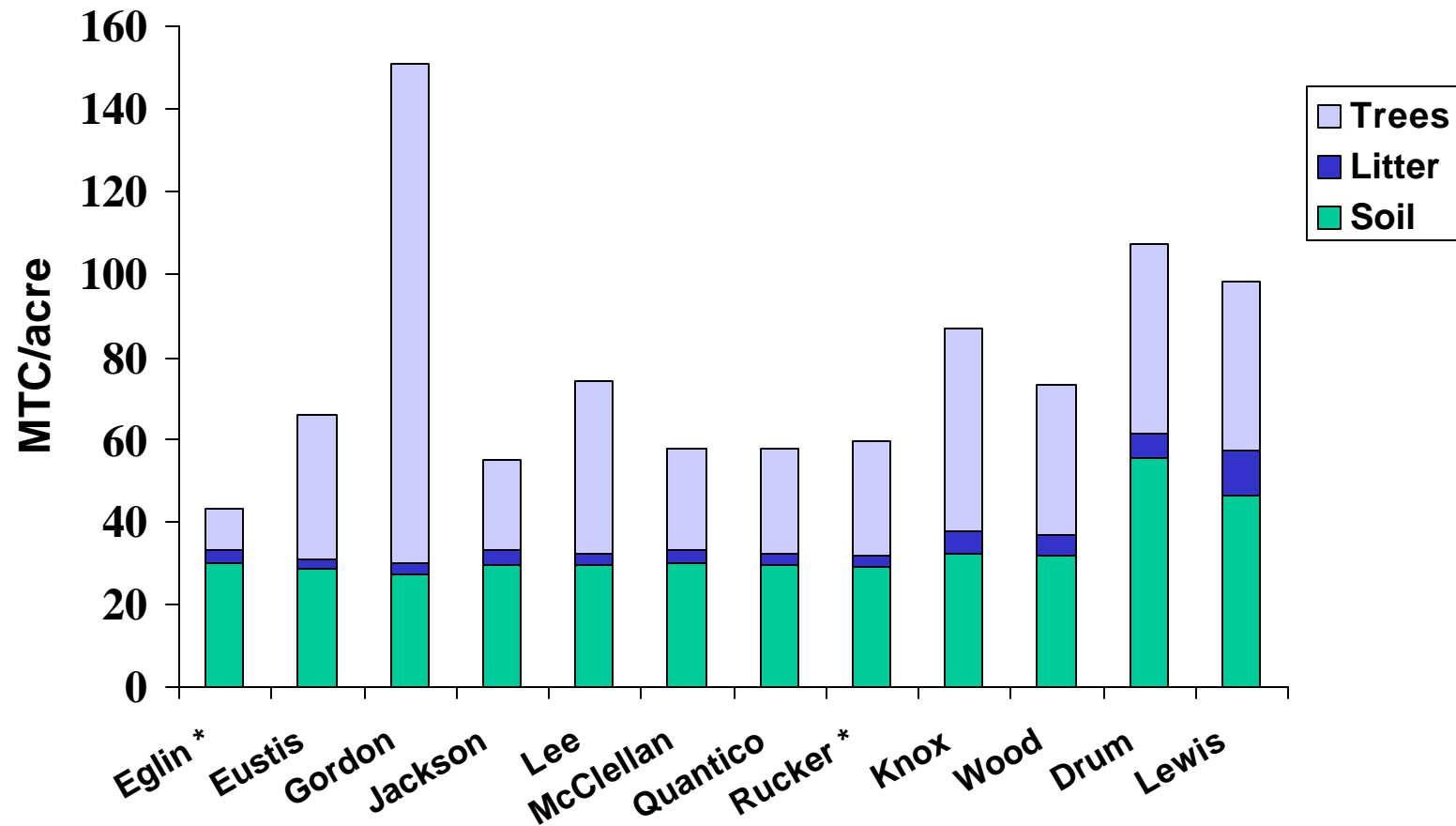- Fort Leonard
  Wood   MO

Current Carbon Storage Estimates

- Estimates are derived from installation inventory data
- Volume-to-carbon conversions are applied
- Stored carbon is partitioned into pools:
  - Soil
  - Litter
  - Coarse Woody Debris
  - Tree Biomass
  - Harvested Carbon (products)

Carbon Storage Estimates
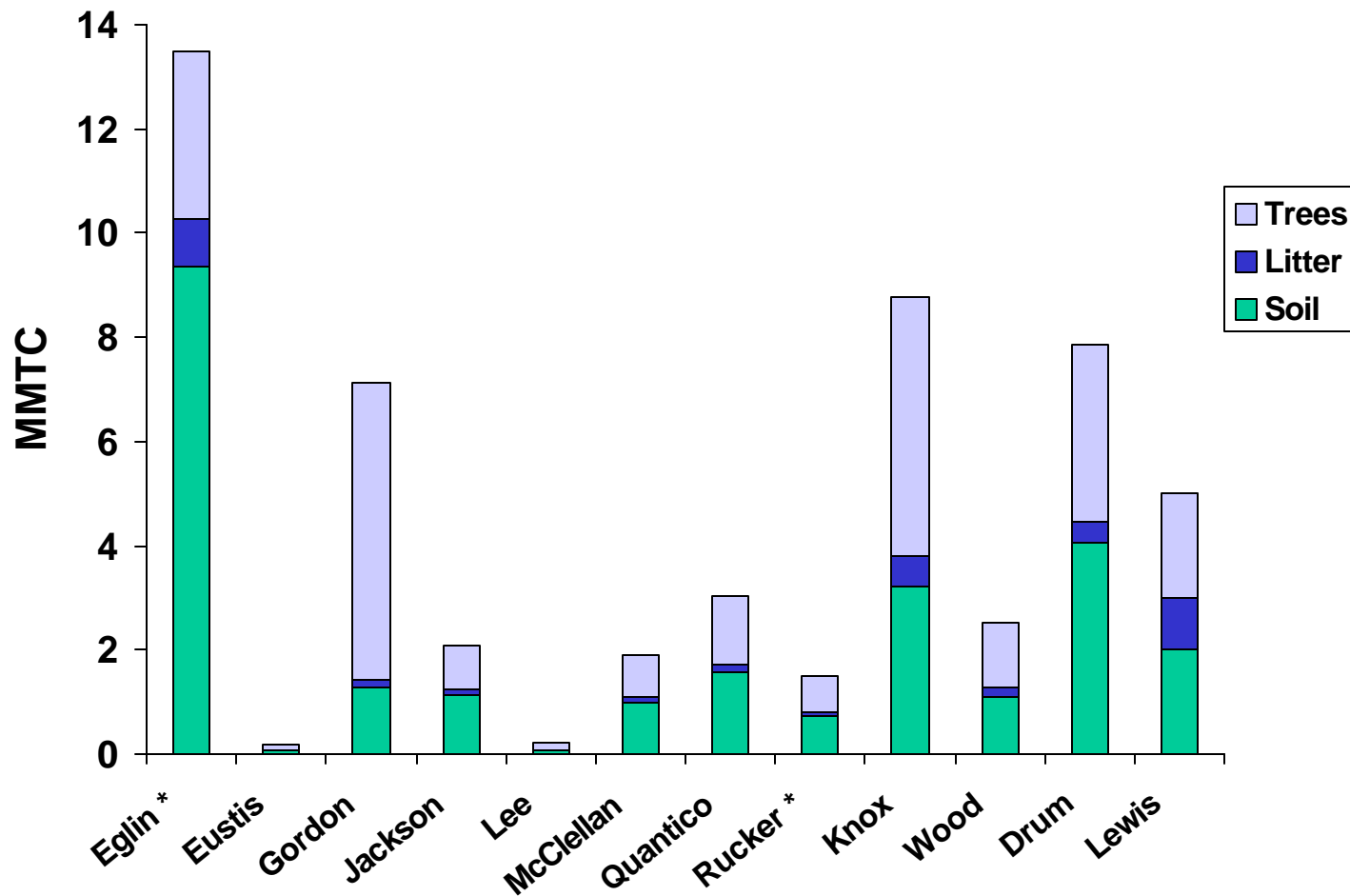
Carbon Storage Per Acre

Carbon Storage Estimates

- Current carbon storage for the study installations ranges from 43-151 MTC/ac, with most sites from 55-70 MTC/ac

- The northern installations tended to have higher carbon storage, mostly from increased soil carbon as a result of cooler climate
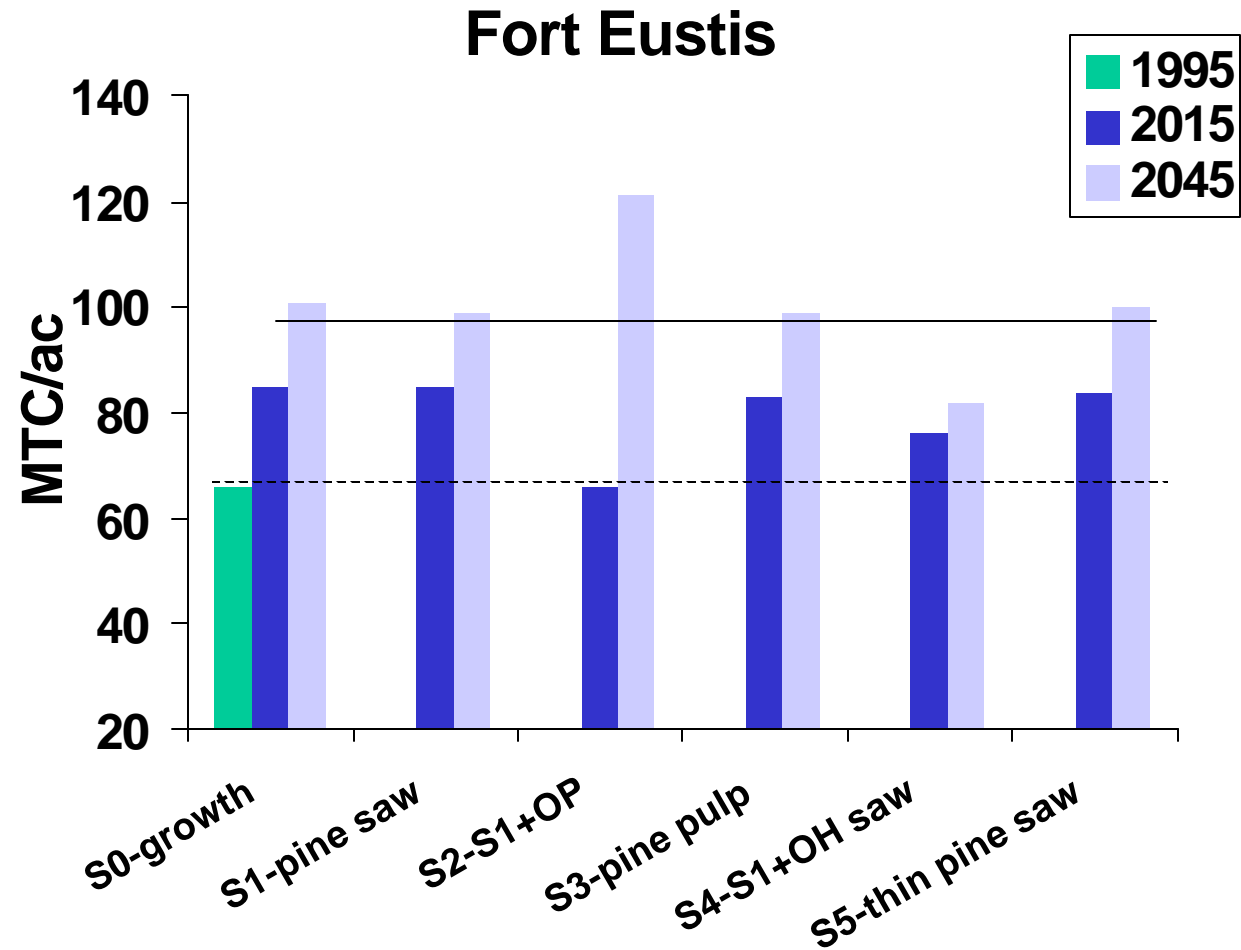
Carbon Storage Estimates (Cont.)

- Carbon storage potential is a function of many factors
  - Age and forest type distribution
  - Stocking levels
  - Site productivity
  - Management history
- The accuracy and validity of a carbon budget depends on the quality of the forest inventory data available

Analysis of Management Options

▸ Six management scenarios of various intensities were simulated

▸ All installations gained carbon under the no management, continued growth scenario

- Forts Gordon and Rucker stored the most
- Fort Jackson and MCB Quantico stored the least

Scenario Results-Group One

- Eustis
- Eglin
- Lee
- Large gain from OP conversion

Fort Eustis

Legend: 1995, 2015, 2045

Y-axis: MTC/ac (20, 40, 60, 80, 100, 120, 140)

X-axis categories: S0-growth, S1-pine saw, S2-S1+OP, S3-pine pulp, S4-S1+OH saw, S5-thin pine saw

Conclusions from Scenario Analyses

- Results differ for each installation
  - Forest type/age class distribution
  - Site factors, including productivity
  - Stocking levels, management history
- "Standard" forest management practices do not cause large changes in carbon storage
- Drastic measures may have a big effect (e.g. conversion of natural oak-pine to plantation)
- Attention to stocking control offers the best opportunities to increase carbon storage

# Urban Forest Carbon Analysis for the Cantonment of Fort Knox, Kentucky

Objectives of Urban Forest Analysis for the Cantonment of Fort Knox

- Quantify vegetation structure
- Estimate current carbon storage and sequestration by trees
- Estimate effects of trees on carbon emissions from power plants
- Estimate air pollution removal by trees
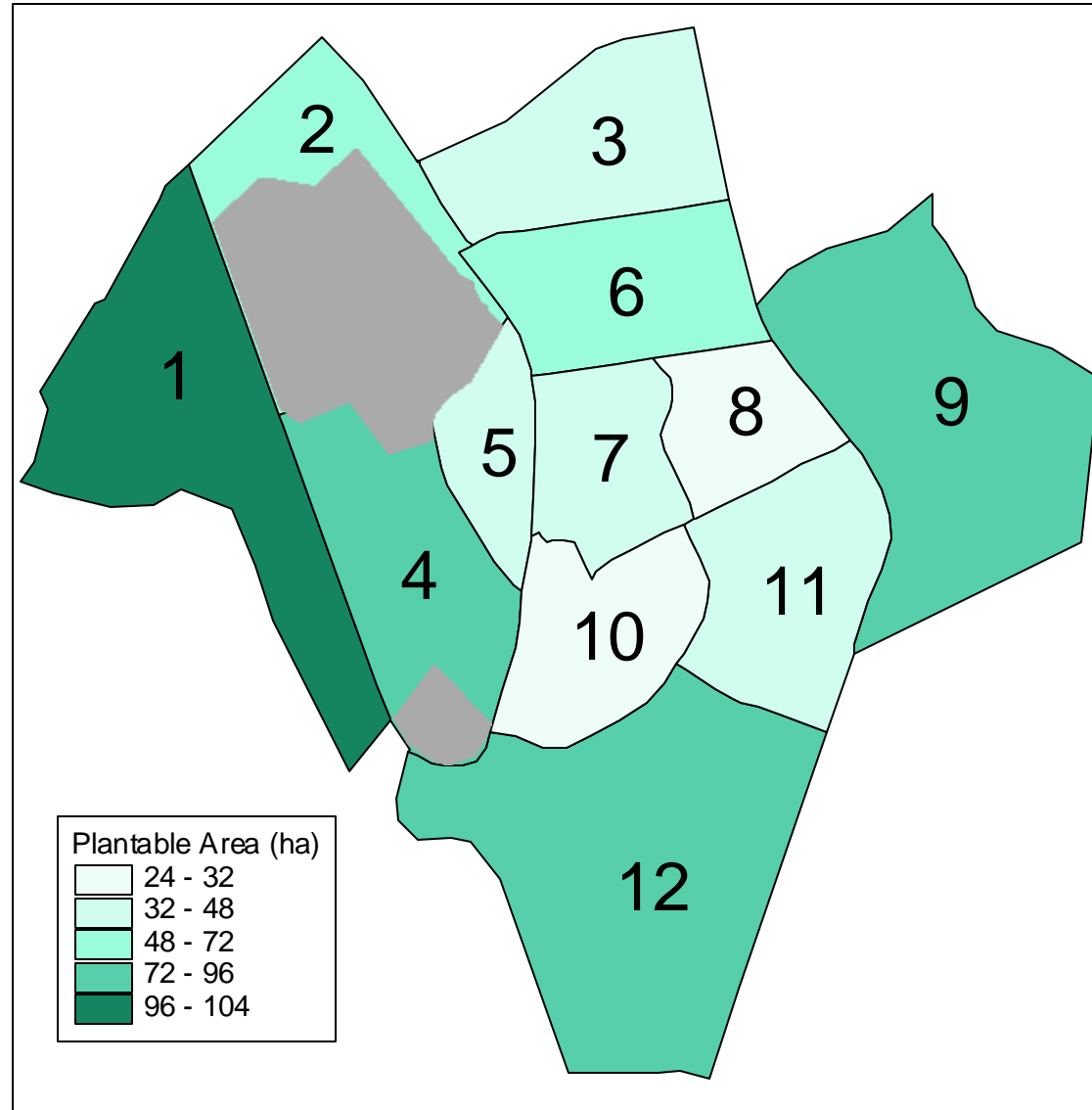- Assess potential effects of future tree establishment

Fort Knox divided into zones of similar vegetation structure to reduce the variance of the field sample estimates
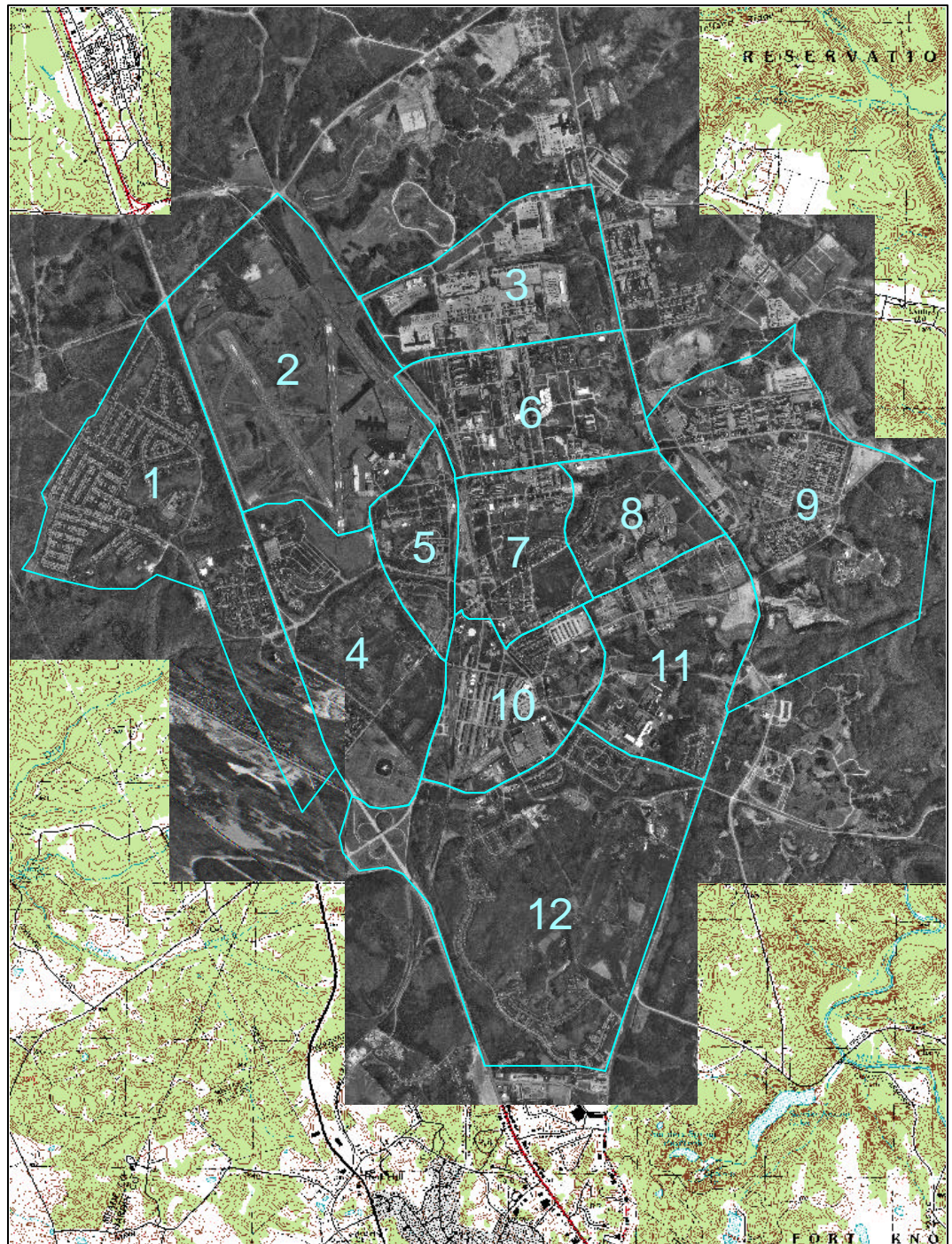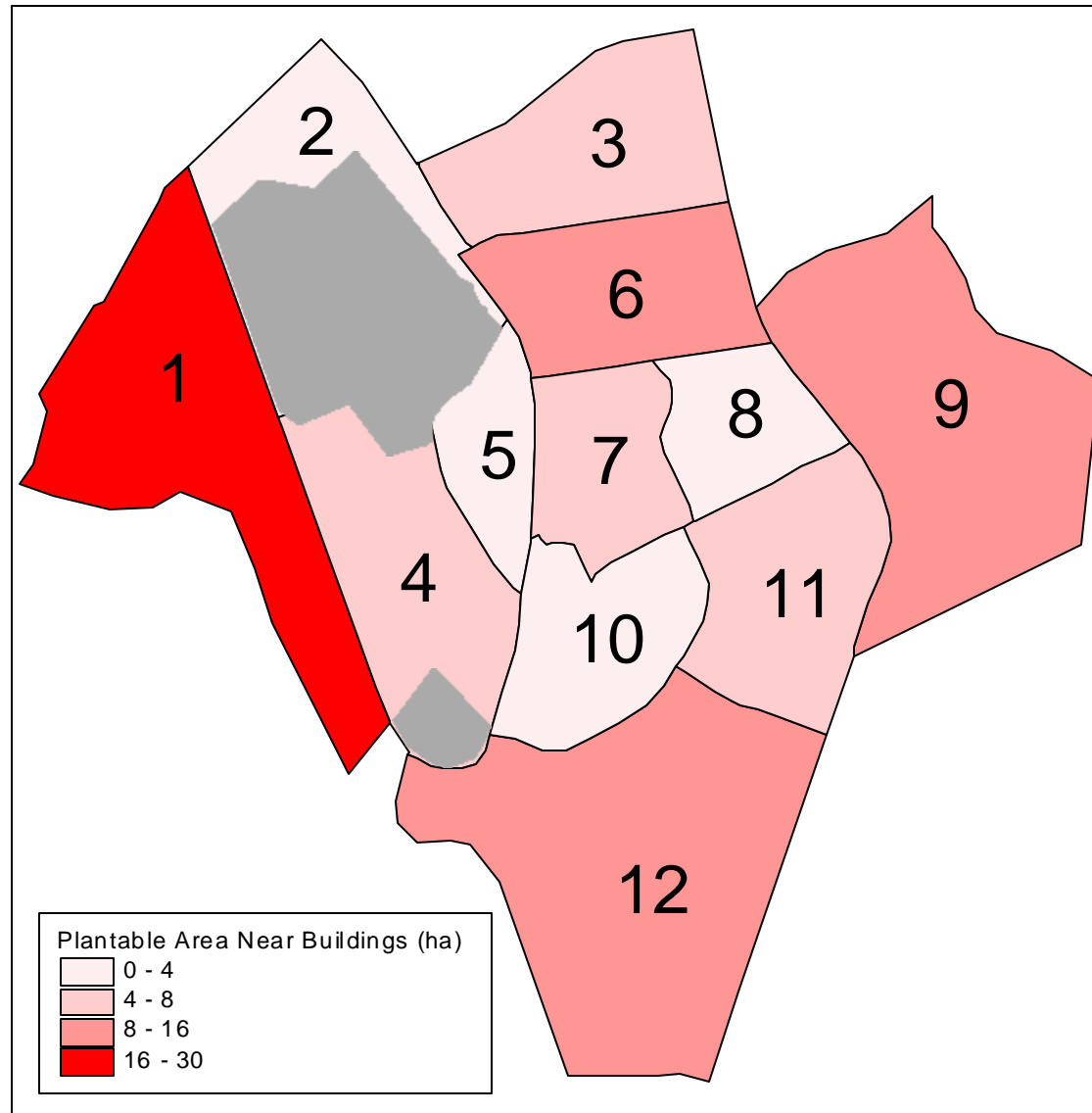
Tree cover in Fort Knox by Vegetation zone

Tree Cover (%)
- 8 - 16
- 16 - 24
- 24 - 32
- 32 - 40
- 40 - 48
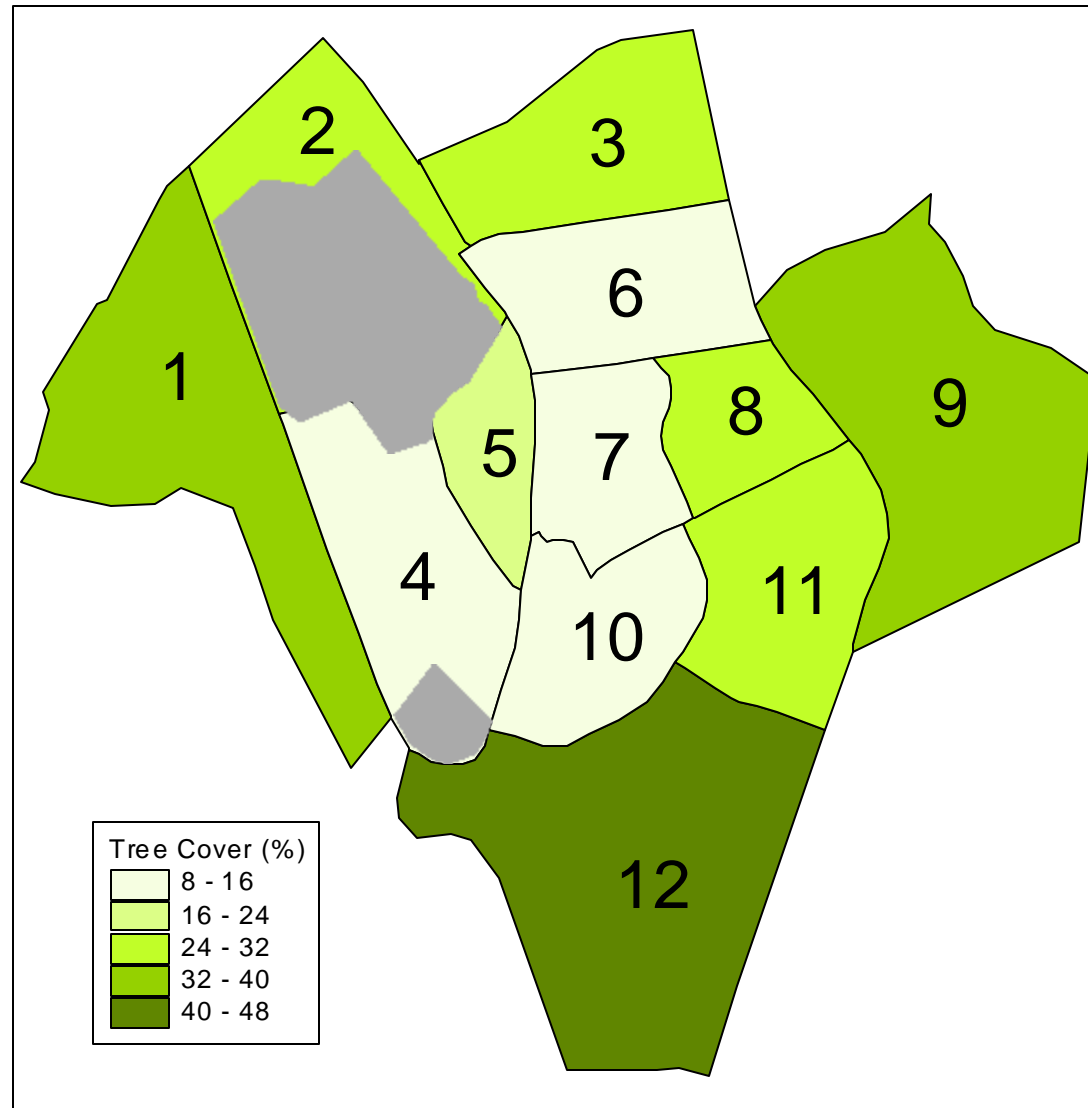
Plantable Area in Cantonment by Vegetation Zone

Plantable Area (ha)
- 24 - 32
- 32 - 48
- 48 - 72
- 72 - 96
- 96 - 104

Plantable Area Near Buildings in Cantonment by Vegetation Zone

Plantable Area Near Buildings (ha)
- 0 - 4
- 4 - 8
- 8 - 16
- 16 - 30

Forest Vegetation of Fort Knox

- Average tree cover is 30% (range 8-47%)
- Common species:
  - Eastern red cedar
  - Tulip tree
  - Sassafras
  - Black Cherry
- Diverse diameter distribution

Forest Carbon Storage and Sequestration, and Air Pollution Removal for Fort Knox

- Current storage is 60,000 tonnes
  - Value is $1,400,000
- Annual net sequestration is 1,200 tC/yr
  - Value is $26,000/yr
- Avoided C emissions is 600 tC/yr
  - Value is $14,000/yr
- Air pollution removal is 59 t/yr
  - Value is $297,000/yr

Estimated Pollution Removal by Trees in the Cantonment by Month
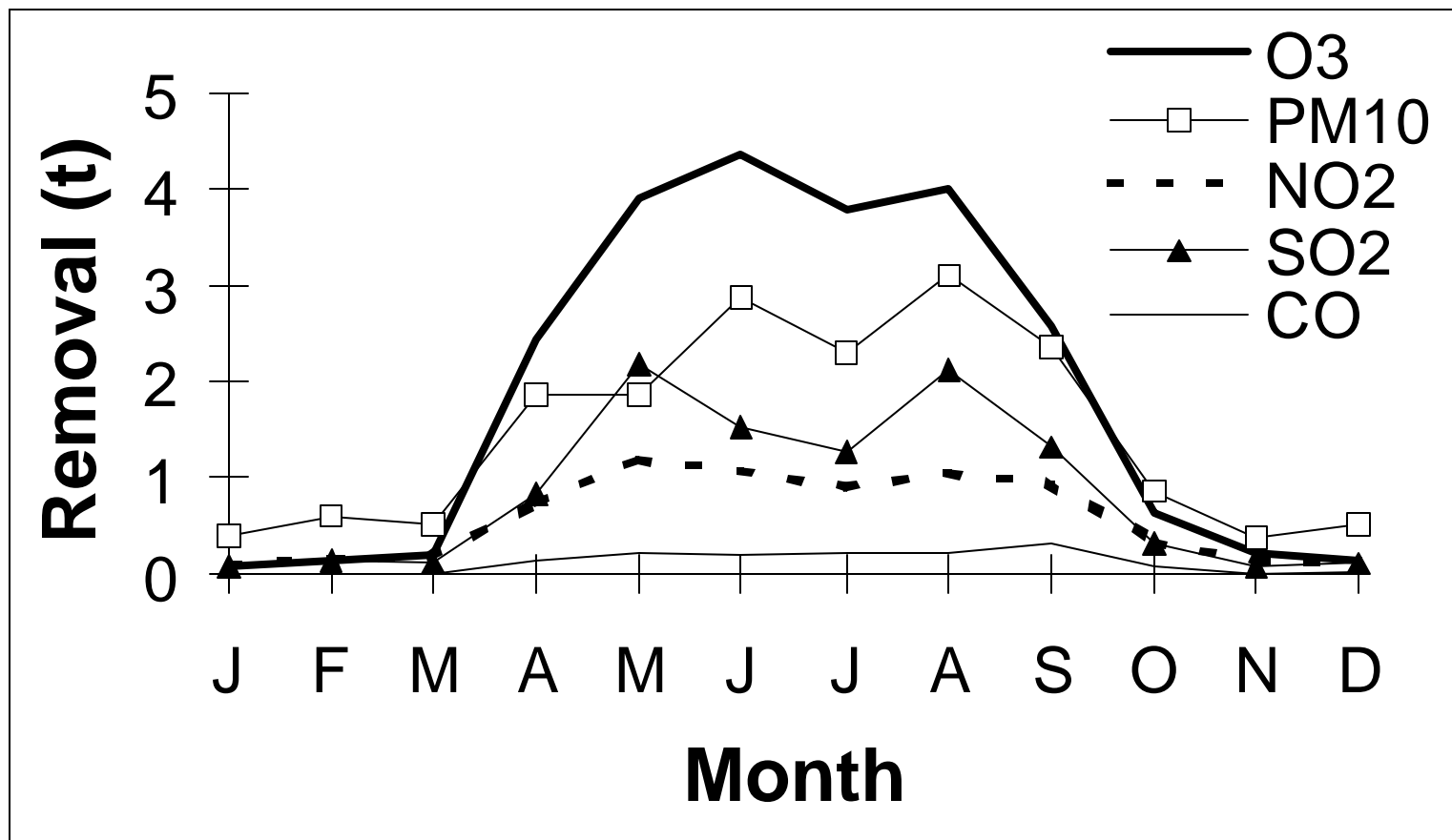
Benefits of Establishing Trees on ½ of the Potentially Available Area (333 ha)

- Plant 24,000 trees in developed areas
- Regenerate 223,000 trees in greenspace
- Increase tree canopy cover from 30 to 45%
- Store an additional 36,500 tC
  - (value = $830,000)
- Avoid an additional 500 tC/yr emissions
  - (value = $11,000/yr)
- Increase air pollution removal by 36 t/yr
  - (value = $182,000/yr)